FCC 47 CFR PART 15 Subpart B

TEST REPORT

Equipment	ISS(interactive smart shelf)
Trademark	LG Display
FCC ID:	2AXECLD230EKS-FPN1
Model No.	LD230EKS-FPN1
Report No.	CTB210430028EX
Applicant	LG Display Co., Ltd. LG TWIN TOWERS (EAST), 128, Yeoui-daero, Yeongdeungpo-gu, Seoul 07336, Republic of Korea
Manufacturer	LG Display Co., Ltd. LG TWIN TOWERS (EAST), 128, Yeoui-daero, Yeongdeungpo-gu, Seoul 07336, Republic of Korea
Prepared by	Shenzhen CTB Testing Technology Co., Ltd. Floor 1&2, Building A, No. 26 of Xinhe Road, Xinqiao Street, Baoan District, Shenzhen China Tel: 086-4008-707-283 Fax: 086-0755-23208027
Date of Receipt	Apr. 22, 2021
Date of Test(s)	Apr. 23, 2021 ~ Apr. 30, 2021
Date of Issue	Apr. 30, 2021

Test Standard(s) CFR47, FCC Part 15 Subpart B, ANSI C63.4: 2014

In the configuration tested, the EUT complied with the standards specified above.

Producer : Amy Yang , Date : Apr. 30, 2021

Amy Yang/ Engineer

Signatory : Bin Mei , Date : Apr. 30, 2021

Bin Mei/ Director

Note: The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report shall not be reproduced except in full, without prior written approval of CTB. This document may be altered or revised by CTB, personnel only, and shall be noted in the revision of the document.

Revision History

Rev.	Issue Date	Revisions	Effect Page	Revised By
0	Nov. 6, 2020	original version	All Page	Sherwin Qian
1	Apr. 30, 2021	New version	All Page	Bin Mei

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1. GENERAL INFORMATION

1.1. Description of EUT

Equipment	ISS(interactive smart shelf)
Trade Mark	LG Display
Model Name	LD230EKS-FPN1
Serial No.	Not labeled
Model Difference	N/A
Operating Frequency	AC120V/60Hz
I/O Port	N/A
EUT Power Rating	DC12V from adapter input AC 120V/60Hz
Configuration	☒ Table-top ☐ Floor-standing
Accessory Device	Adapter
Cable Supplied	N/A

Note:

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

The EUT uses following Adapter

Adapter	1
Manufacturer	CTL
Model	GQ36-120300-AU
AC Input Power	100-240V, 50/60Hz,1.0A Max
DC Output Power	12V⎓3A
Plug Type	N/A

1. Other Accessory Device List and Details

Description	Manufacturer	Model	Note
-			

External I/O Cable

Cable Description	Shielded Type	Ferrite Core	Length(m)	Note
-	☐Shielded ☐Non-shielded	☐Yes ☐No	-	

2. The above EUT information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications or the User's Manual.

2. TEST SUMMARY

Test procedures according to the technical standards:

FCC Rules	Test Item	Test Result
§15.107	Conducted Emission	PASS
§15.109	Radiated Emission	PASS

Remark: N/A is abbreviation for Not Applicable.

The test was carried out in all the test modes, only the worst data are list in report.

Here have changed: Type C interface (1 grain), Backlit chip(1 grain), Backlit inductance(1 grain), The backlight circuit matches the resistor(3 grain) is different, the same specification and other information are the same.

3. FACILITIES

3.1. Test Facility

Shenzhen CTB Testing Technology Co., Ltd.
Floor 1&2, Building A, No. 26 of Xinhe Road, Xinqiao Street, Baoan District, Shenzhen China
CNAS Registration Number is L4595.
A2LA Certificate Number is 5599.01.

3.2. Test Instruments

The following list contains measurement equipment used for testing. The equipment conforms to the requirement of CISPR 16-1, ANSI C63.2 and other required standards.

Calibration of all test and measurement, including any accessories that may effect such calibration, is checked frequently to ensure the accuracy. Adjustments are made and correction factors are applied in accordance with the instructions contained in the respective.

Table list of the test and measurement equipment

Conducted Emission Measurement

Item	Equipment	Manufacturer	Model No.	Serial No.	Calibrated until
1	AMN	R&S	ESH3-Z5	831551852	2021.10.30
2	Pulse limiter	R&S	ESH3Z2	357881052	2021.10.30
3	EMI test Receiver	R&S	ESCI	834115/006	2021.11.01
4	Coaxial cable	ZDECL	Z302S-BNCJ-BNCJ-1.5M	18091904	2021.10.30
5	CE Test software	FALA	EZ-EMC	Ver. EMC-con3A1.1	N/A

Radiated Emission Measurement

Item	Equipment	Manufacturer	Model No.	Serial No.	Calibrated until
1	TRILOG Broadband Antenna	Schwarzbeck	VULB 9168	869	2021.11.02
2	Double Ridged Broadband Horn Antenna	Schwarzbeck	BBHA 9120 D	1911	2021.11.02
3	Preamplifier	Agilent	8449B	3008A01838	2021.11.01
4	Amplifier	HP	8447E	2945A02747	2021.11.01
5	Coaxial cable	ETS	RFC-SNS-100-NMS-80 NI	/	2021.11.01
6	Coaxial cable	ETS	RFC-SNS-100-NMS-20 NI	/	2021.11.01
7	Coaxial cable	ETS	RFC-SNS-100-SMS-20 NI	/	2021.11.01
8	Coaxial cable	ETS	RFC-NNS-100-NMS-300 NI	/	2021.11.01
9	EMI test Receiver	R&S	ESPI	100362	2021.11.01
10	MXA signal analyzer	Agilent	N9020A	MY52090073	2021.11.01
11	RE Test software	FALA	EZ-EMC	Ver. FA-03A2 RE	N/A

4. Measurement uncertainty

The following table is for the measurement uncertainty, which is calculated as per the document CISPR 16-4 and ANSI C63.4.

Test	Parameters	Expanded Uncertainty (U_{Lab})	Expanded Uncertainty (U_{Cispr})
Conducted Emission	Level Accuracy: 150kHz to 30MHz	±1.22 dB	±3.6 dB
Radiated Emission	Level Accuracy: 30MHz to 1000 MHz	±3.67 dB	±5.2 dB
Radiated Emission	Level Accuracy: Above 1000MHz	±4.79 dB	N/A

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

4.1. Operating condition of EUT

To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively

Pretest Mode	Description
Mode	Charging+USB+HDMI

For Conducted Test	
Final Test Mode	Description
Mode	Charging+USB+HDMI

For Radiated Test	
Final Test Mode	Description
Mode	Charging+USB+HDMI

Charging, USB and HDMI three modes were tested at AC 120V/60Hz and AC230V/50Hz, only the worst result of Charging+USB+HDMI test mode for AC 120V/60Hz was reported.

4.2. Test conditions

Temperature: 15-35℃
Relative Humidity: 30-60 %
Atmospheric pressure: 800hPa-1060hPa

5. Conducted Emission

5.1. Limit

☐ Except for Class A devices:

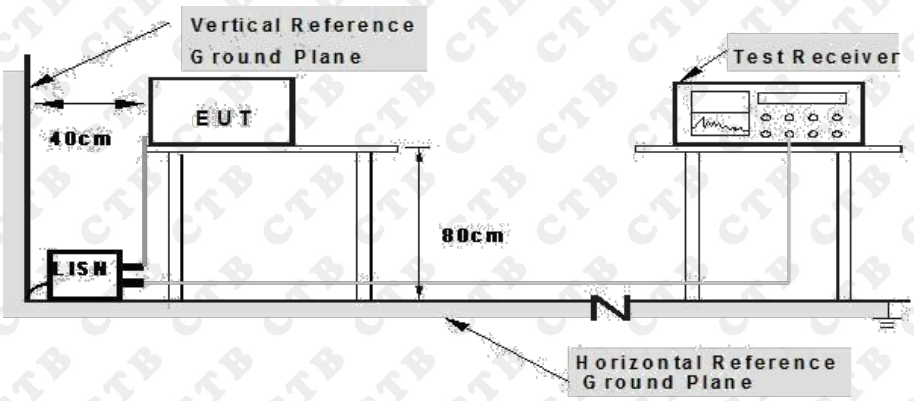
Frequency of emission (MHz)	Conducted limit (dBμV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

*Decreases with the logarithm of the frequency.

☒ For Class A devices:

Frequency of emission (MHz)	Conducted limit (dBμV)	
	Quasi-peak	Average
0.15-0.5	79	66
0.5-30	73	60

5.2. Test setup



Note: 1.Support units were connected to second LISN.
2.Both of LISNs (AMN) are 80 cm from EUT and at least 80 from other units and other metal planes

The setup of EUT is according with ANSI C63.4 measurement procedure. Specification used with FCC Part 15 limits.

5.3. EMI Test Receiver Setup

Frequency Range	9kHz-30MHz
Resolution Bandwidth	200Hz (9kHz-150kHz) 9kHz (150kHz-30MHz)

5.4. Test procedure

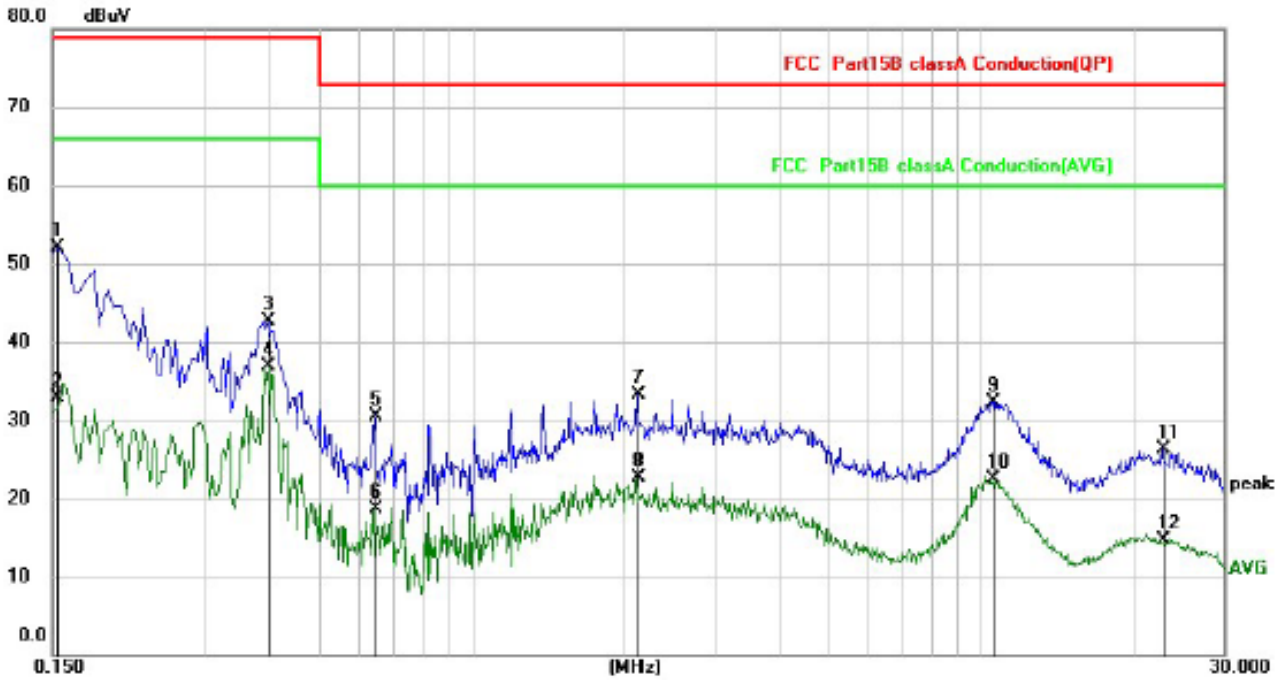
Measurement was performed in shielded room, and instruments used were followed clause 4 of ANSI C63.4.
Detailed test procedure was following clause 7 of ANSI C63.4.
Frequency range 150kHz – 30MHz was checked and EMI receiver measurement bandwidth was set to 9 kHz.

5.5. Test results

PASS

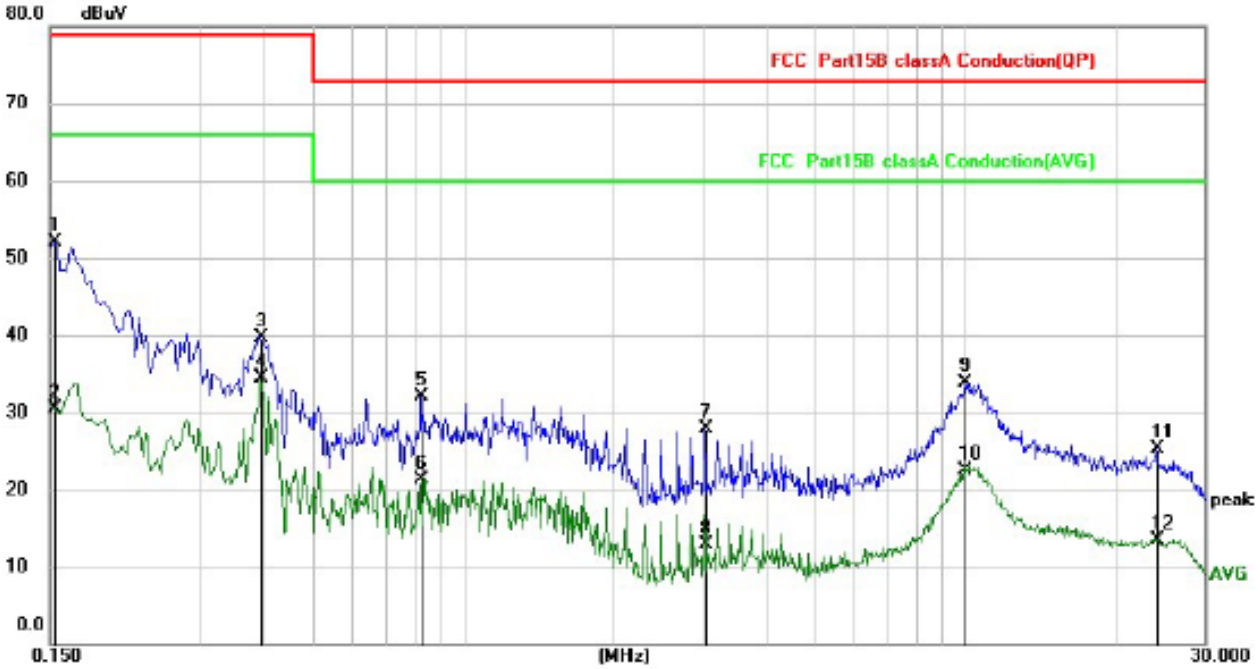
Please refer to the following page.

Polarization: L



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin	
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector
1	*	0.1539	42.12	9.96	52.08	79.00	-26.92	QP
2		0.1539	22.96	9.96	32.92	66.00	-33.08	AVG
3		0.3980	32.84	9.96	42.80	79.00	-36.20	QP
4		0.3980	26.86	9.96	36.82	66.00	-29.18	AVG
5		0.6460	20.64	9.96	30.60	73.00	-42.40	QP
6		0.6460	8.72	9.96	18.68	60.00	-41.32	AVG
7		2.1180	23.25	10.02	33.27	73.00	-39.73	QP
8		2.1180	12.72	10.02	22.74	60.00	-37.26	AVG
9		10.5140	21.56	10.82	32.38	73.00	-40.62	QP
10		10.5140	11.77	10.82	22.59	60.00	-37.41	AVG
11		22.7420	15.22	11.18	26.40	73.00	-46.60	QP
12		22.7420	3.62	11.18	14.80	60.00	-45.20	AVG

Polarization: N



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin	
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector
1	*	0.1539	42.09	9.96	52.05	79.00	-26.95	QP
2		0.1539	20.61	9.96	30.57	66.00	-35.43	AVG
3		0.3940	29.74	9.96	39.70	79.00	-39.30	QP
4		0.3940	24.49	9.96	34.45	66.00	-31.55	AVG
5		0.8260	22.18	9.96	32.14	73.00	-40.86	QP
6		0.8260	11.26	9.96	21.22	60.00	-38.78	AVG
7		3.0380	17.85	10.07	27.92	73.00	-45.08	QP
8		3.0380	2.87	10.07	12.94	60.00	-47.06	AVG
9		10.0140	23.11	10.80	33.91	73.00	-39.09	QP
10		10.0140	11.63	10.80	22.43	60.00	-37.57	AVG
11		24.1140	14.11	11.21	25.32	73.00	-47.68	QP
12		24.1140	2.25	11.21	13.46	60.00	-46.54	AVG

6. Radiated emissions

6.1. Limit

☐ Except for Class A devices (at 3m):

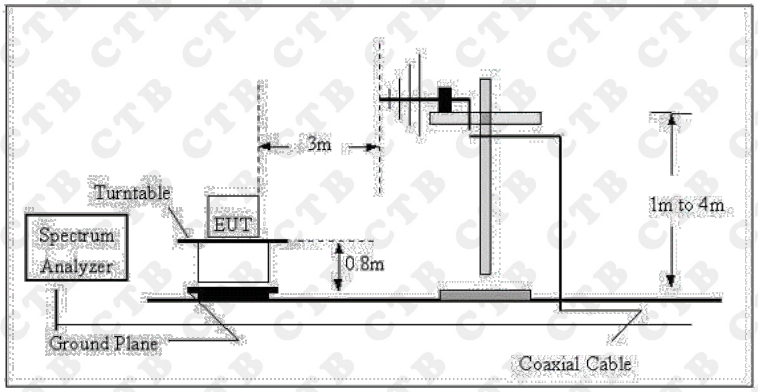
Frequency of emission (MHz)	Field strength (microvolts/meter)	
	(microvolts/meter)	(dBμV/m)
30-88	100	40
88-216	150	43.5
216-960	200	46
Above 960	500	54

☒ For Class A devices (at 10m):

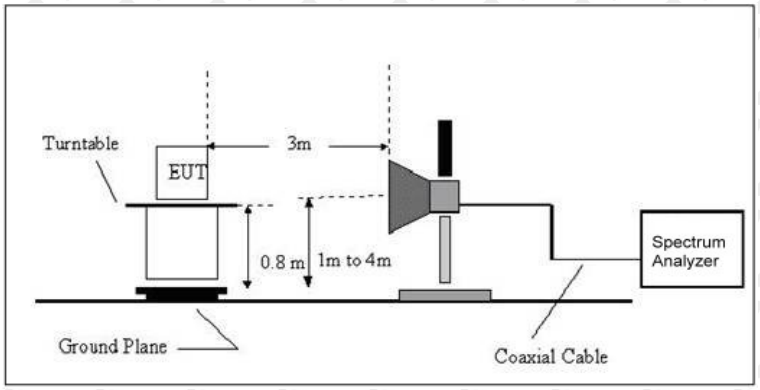
Frequency of emission (MHz)	Field strength (microvolts/meter)	
	(microvolts/meter)	(dBμV/m)
30-88	90	39
88-216	150	43.5
216-960	210	46.4
Above 960	300	49.5

6.2. Test setup

Radiated Emission Test Set-Up Frequency Below 1 GHz



Radiated Emission Test Set-Up Frequency Above 1GHz



The radiated tests were performed in semi-anechoic(3m) test site, using the setup accordance with the ANSI C63.4:2014.

6.3. EMI Test Receiver Setup and Spectrum Analyzer Setup

During the radiated emission test, the EMI test receiver and Spectrum Analyzer were set with the following configurations:

Frequency Range	RBW	Video B/W	IF B/W	Detector
30MHz-1000MHz	100kHz	300kHz	120kHz	QP
Above 1GHz	1MHz	3MHz	/	PK
	1MHz	10Hz	/	AVG

6.4. Test procedure

The measurement was performed in a 3m semi-anechoic chamber, and instruments used were f ollowed clause 4 of ANSI C63.4.

Detailed test procedure was following clause 8 of ANSI C63.4.

Note: for the measurement distance other than 3m and 10m, the limit is varied according to 20dB /10 decades.

6.5. Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Loss, and subtracting the Amplifier Gain from the Meter Reading. The basic equation is as follows:

Corrected Amplitude = Meter Reading + Antenna Factor + Cable Loss - Amplifier Gain

The “Margin” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of 7dB means the emission is 7dB below the limit. The equation for margin calculation is as follows:

Margin = Limit – Corrected Amplitude

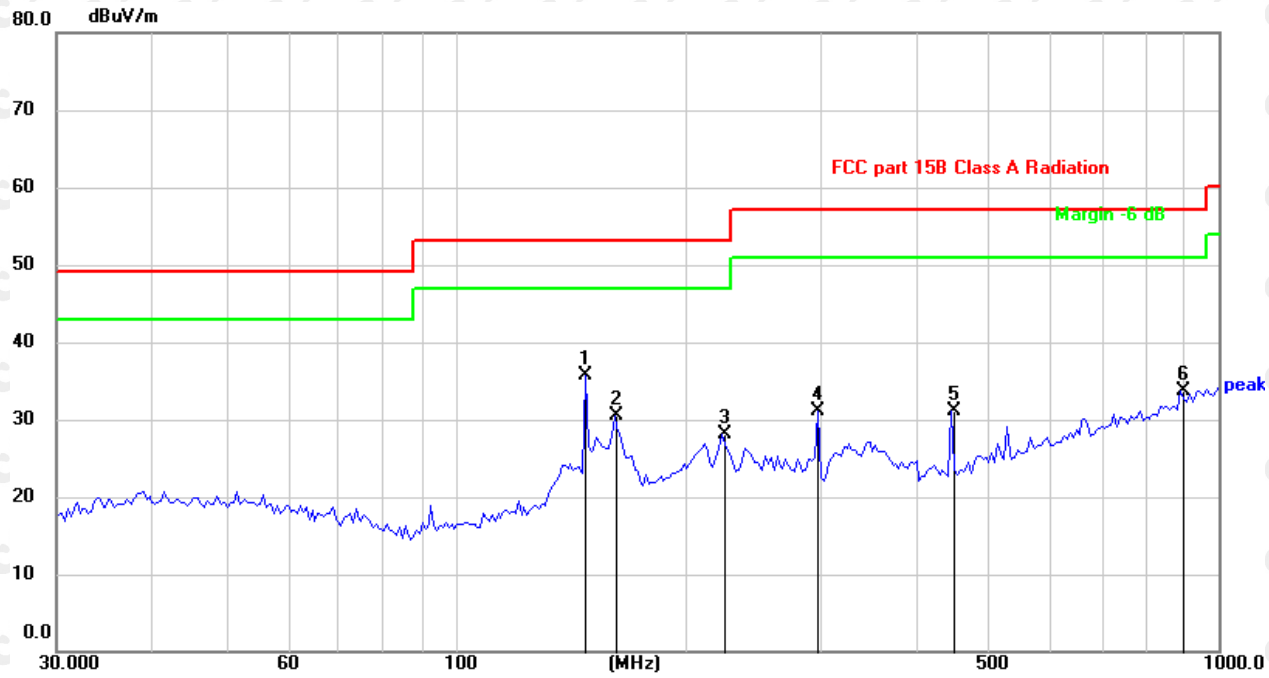
6.6. Test results

PASS

Please refer to the following page.

Below 1 G

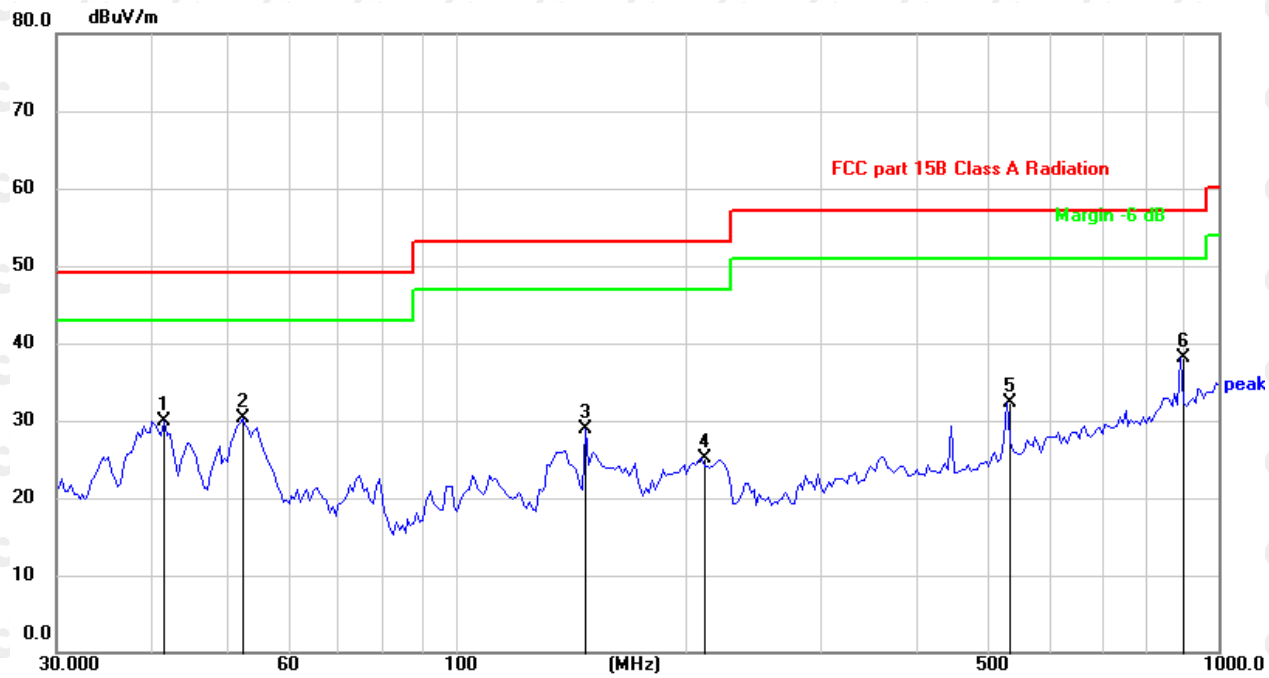
Polarization: H



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dB/m	dB	Detector
1	*	147.9214	42.81	-7.08	35.73	53.00	-17.27	QP
2		161.4742	37.29	-6.86	30.43	53.00	-22.57	QP
3		223.3415	37.76	-9.56	28.20	53.00	-24.80	QP
4		298.2681	37.97	-6.87	31.10	57.00	-25.90	QP
5		446.4141	34.81	-3.64	31.17	57.00	-25.83	QP
6		892.2909	28.28	5.46	33.74	57.00	-23.26	QP

Note: Result=Reading+Factor
Over Limit=Result-Limit

Polarization: V

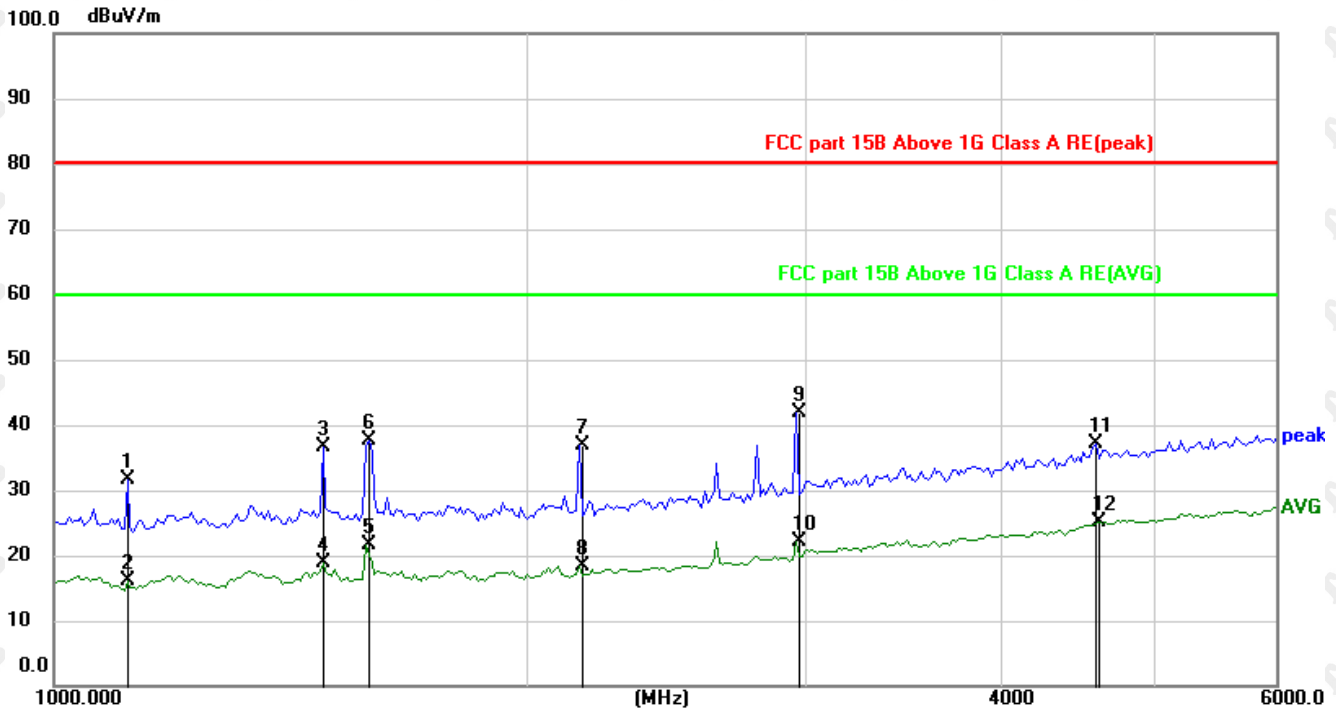


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dB/m	dB	Detector
1		41.4942	36.82	-6.84	29.98	49.00	-19.02	QP
2	*	52.5753	37.75	-7.38	30.37	49.00	-18.63	QP
3		147.9214	35.95	-7.08	28.87	53.00	-24.13	QP
4		210.0482	35.04	-10.01	25.03	53.00	-27.97	QP
5		527.3205	33.87	-1.63	32.24	57.00	-24.76	QP
6		892.2909	32.64	5.46	38.10	57.00	-18.90	QP

Note: Result=Reading+Factor
Over Limit=Result-Limit

Above 1 G

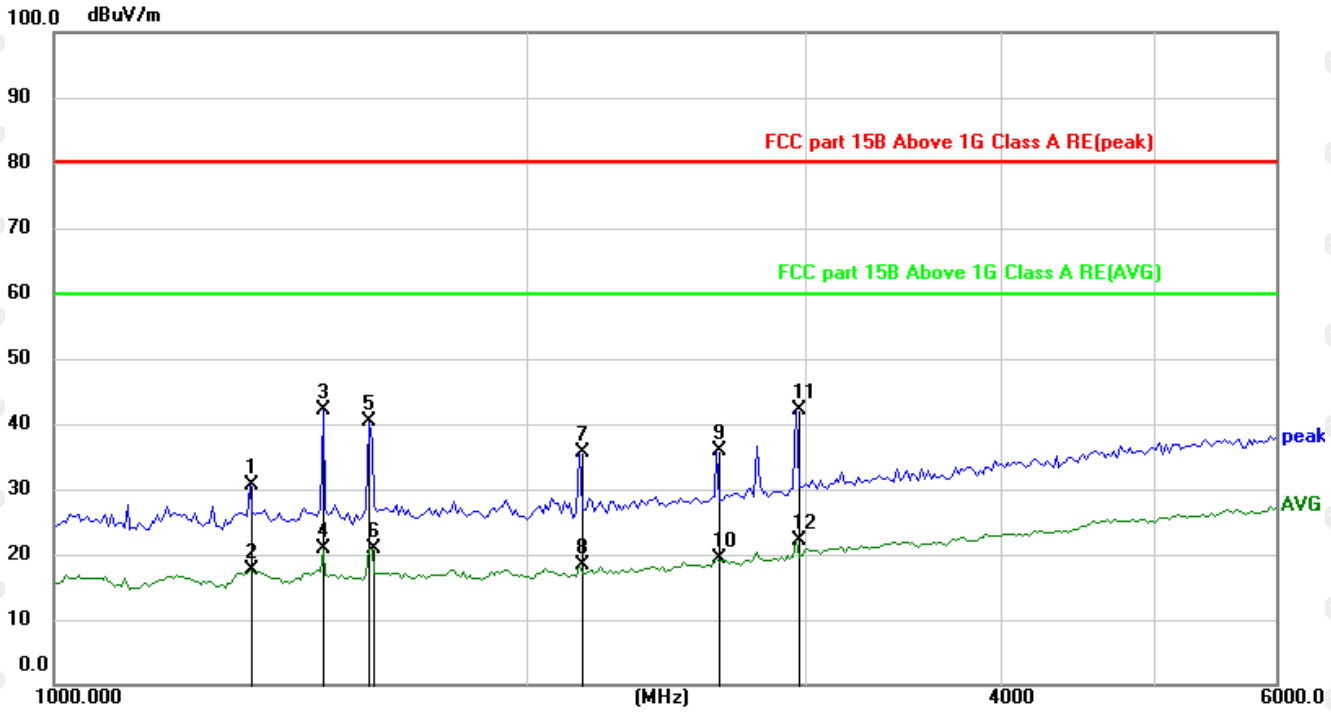
Polarization: H



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dB/m	dB	Detector
1		1113.497	39.53	-7.97	31.56	80.00	-48.44	peak
2		1113.497	24.12	-7.97	16.15	60.00	-43.85	AVG
3		1483.178	42.20	-5.55	36.65	80.00	-43.35	peak
4		1483.178	24.54	-5.55	18.99	60.00	-41.01	AVG
5		1579.169	26.93	-5.28	21.65	60.00	-38.35	AVG
6		1586.258	42.84	-5.26	37.58	80.00	-42.42	peak
7		2160.753	40.36	-3.44	36.92	80.00	-43.08	peak
8		2160.753	21.80	-3.44	18.36	60.00	-41.64	AVG
9		2969.798	42.07	-0.12	41.95	80.00	-38.05	peak
10		2969.798	22.20	-0.12	22.08	60.00	-37.92	AVG
11		4606.530	31.57	5.66	37.23	80.00	-42.77	peak
12	*	4627.211	19.34	5.73	25.07	60.00	-34.93	AVG

Note: Result=Reading+Factor
Over Limit=Result-Limit

Polarization: V



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dB/m	dB	Detector
1		1332.000	37.06	-6.35	30.71	80.00	-49.29	peak
2		1332.000	24.09	-6.35	17.74	60.00	-42.26	AVG
3		1483.178	47.68	-5.55	42.13	80.00	-37.87	peak
4		1483.178	26.51	-5.55	20.96	60.00	-39.04	AVG
5		1586.258	45.53	-5.26	40.27	80.00	-39.73	peak
6		1593.380	26.09	-5.25	20.84	60.00	-39.16	AVG
7		2160.753	39.14	-3.44	35.70	80.00	-44.30	peak
8		2160.753	21.78	-3.44	18.34	60.00	-41.66	AVG
9		2643.304	37.31	-1.47	35.84	80.00	-44.16	peak
10		2643.304	20.86	-1.47	19.39	60.00	-40.61	AVG
11		2969.798	42.15	-0.12	42.03	80.00	-37.97	peak
12	*	2969.798	22.31	-0.12	22.19	60.00	-37.81	AVG

Note: Result=Reading+Factor
Over Limit=Result-Limit

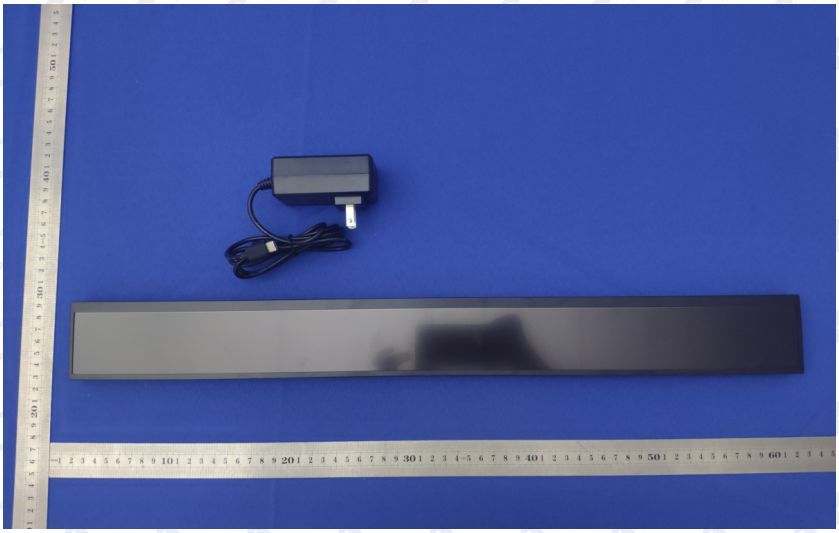
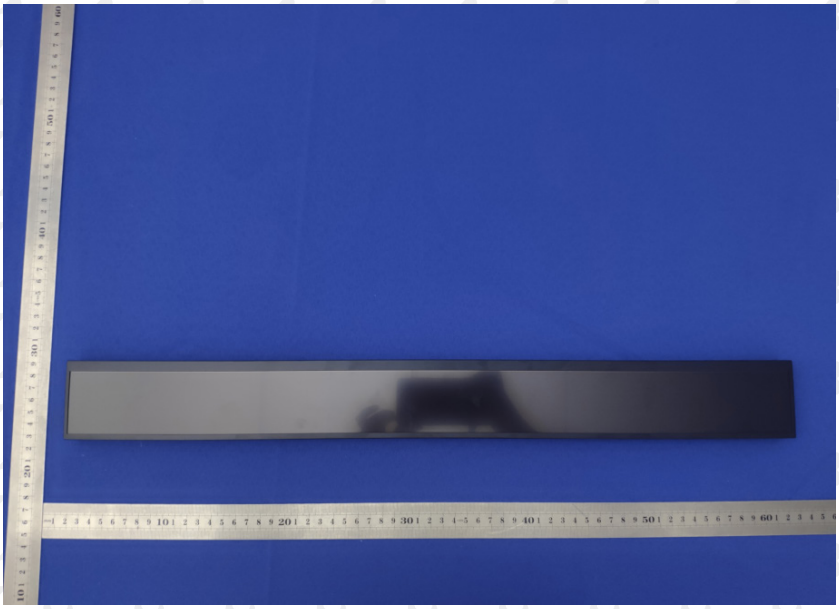
7. Photographs of test setup

Photograph of test setup for Conducted Emission

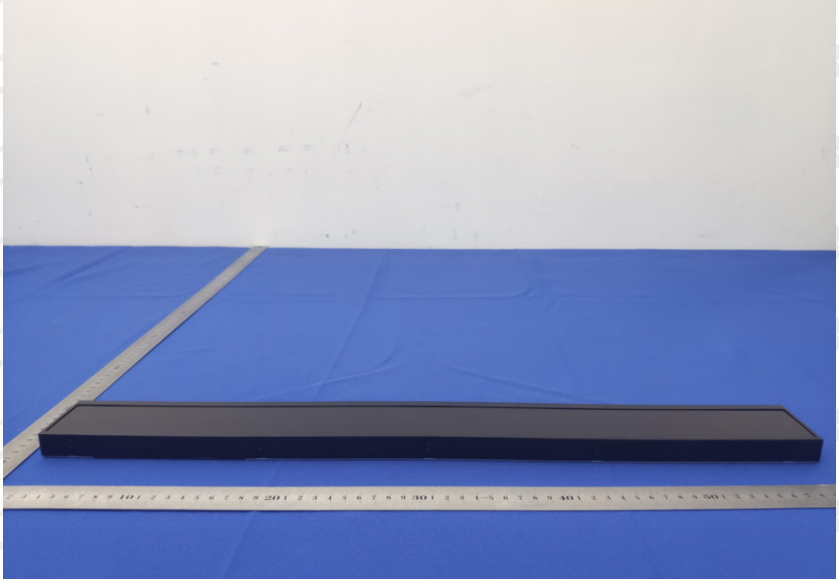
Photograph of test setup for Radiated Emission below 1 G

Photograph of test setup for Radiated Emission above 1 G

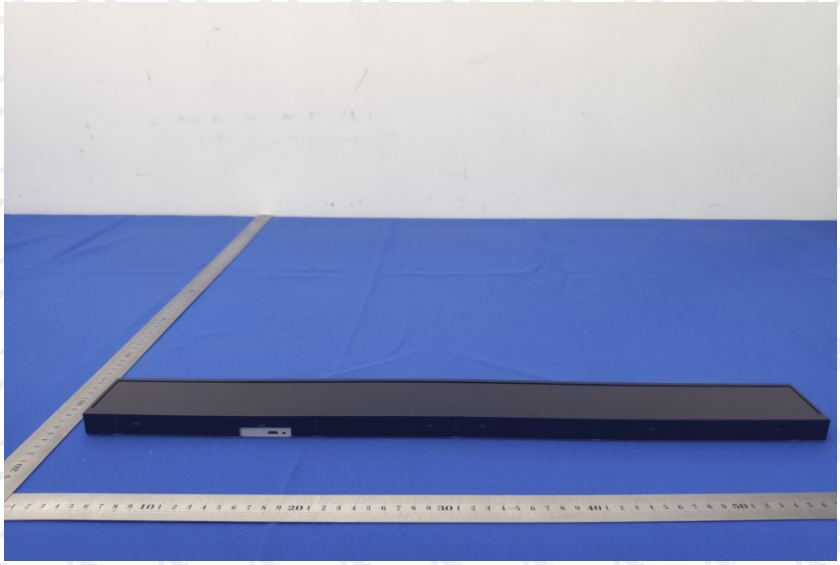
8. Photographs of EUT

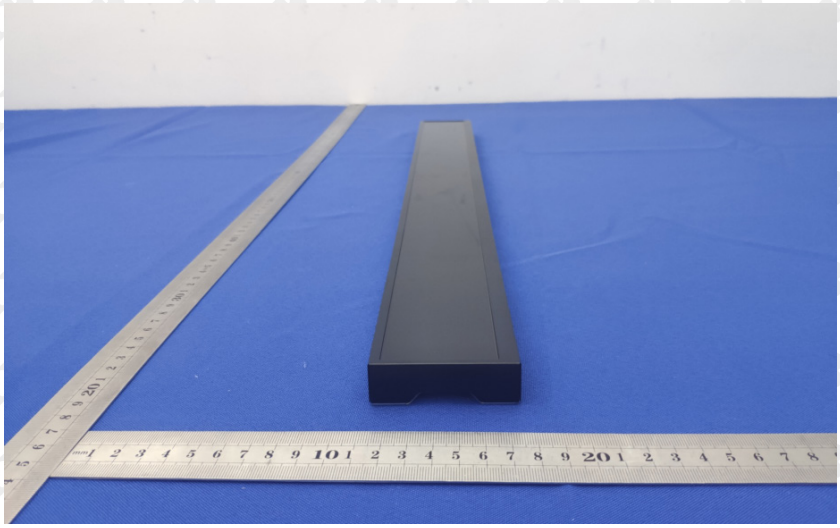
Photographs of EUT



Photographs of EUT

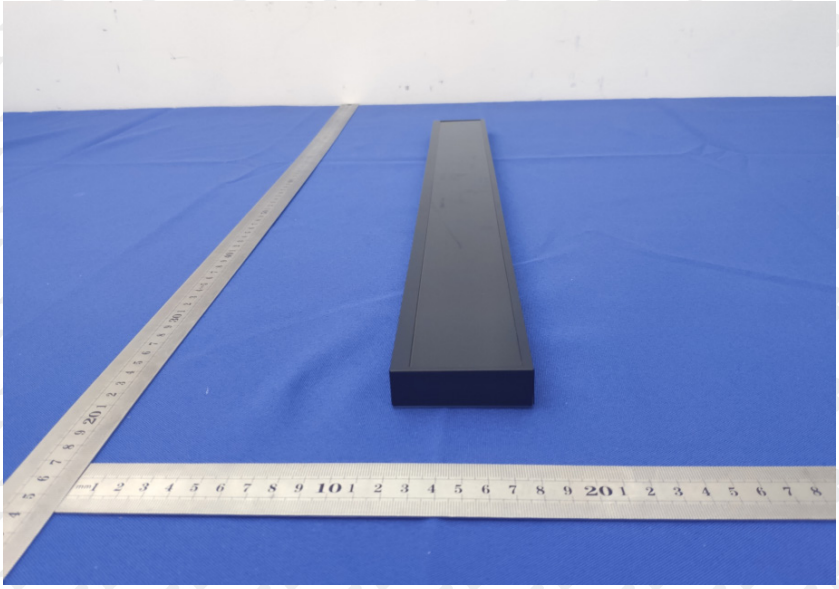


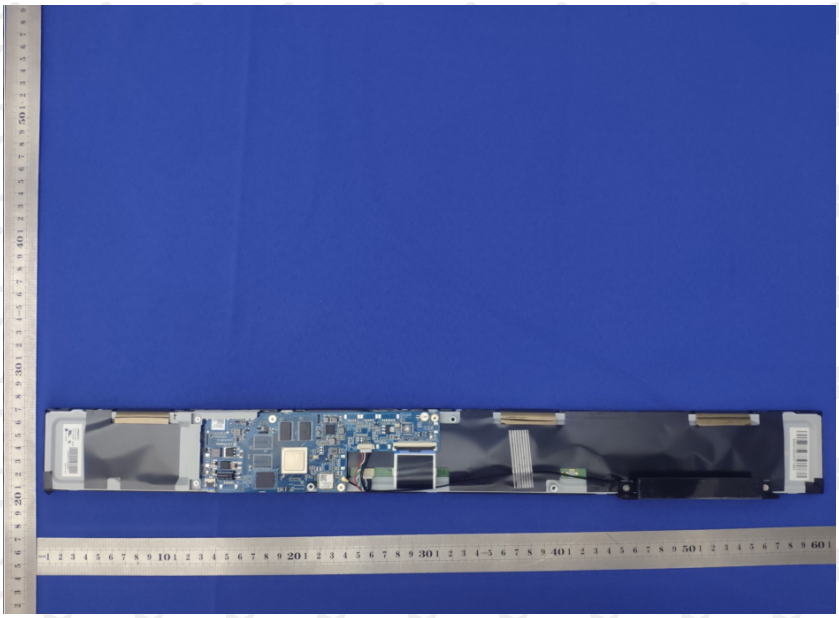
Photographs of EUT



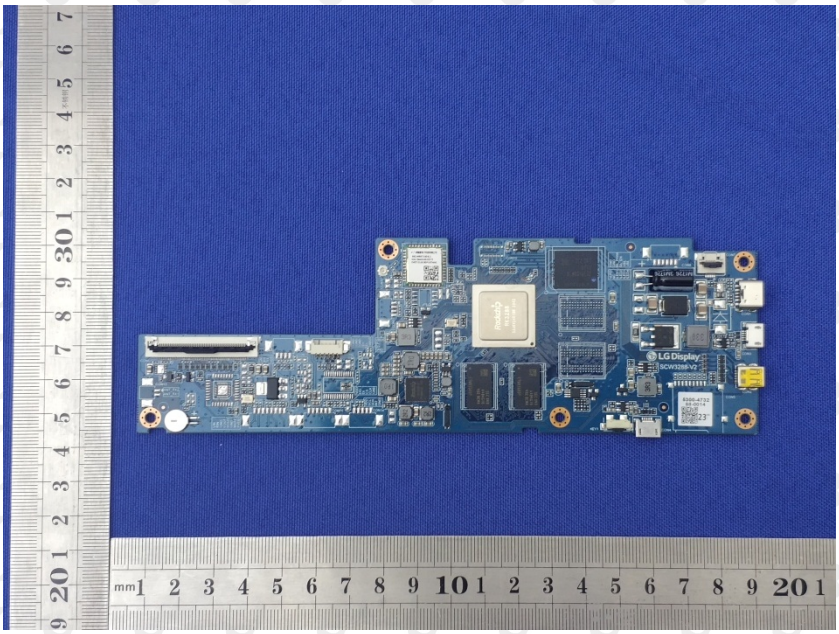


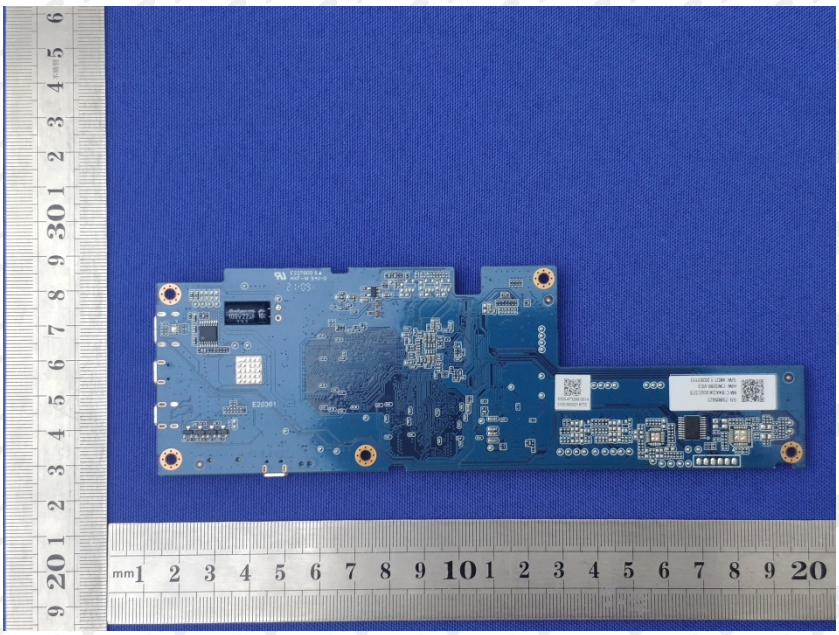
Photographs of EUT



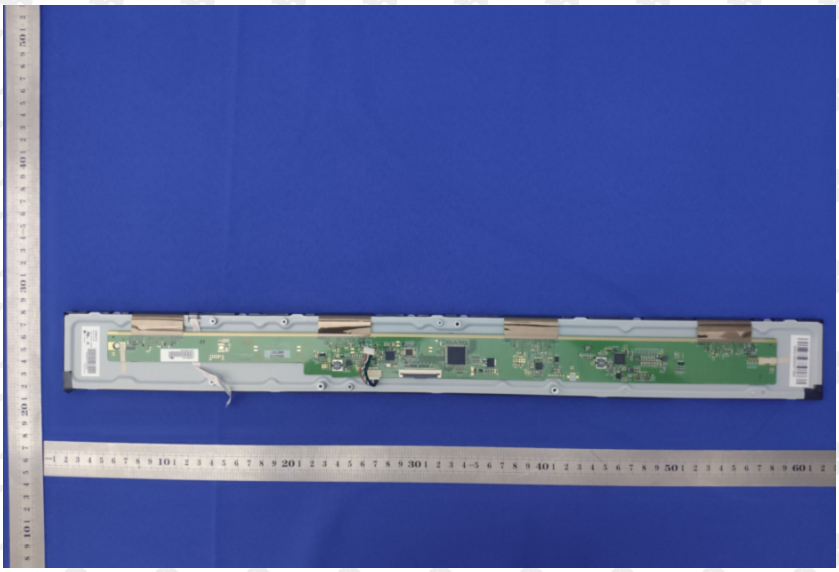


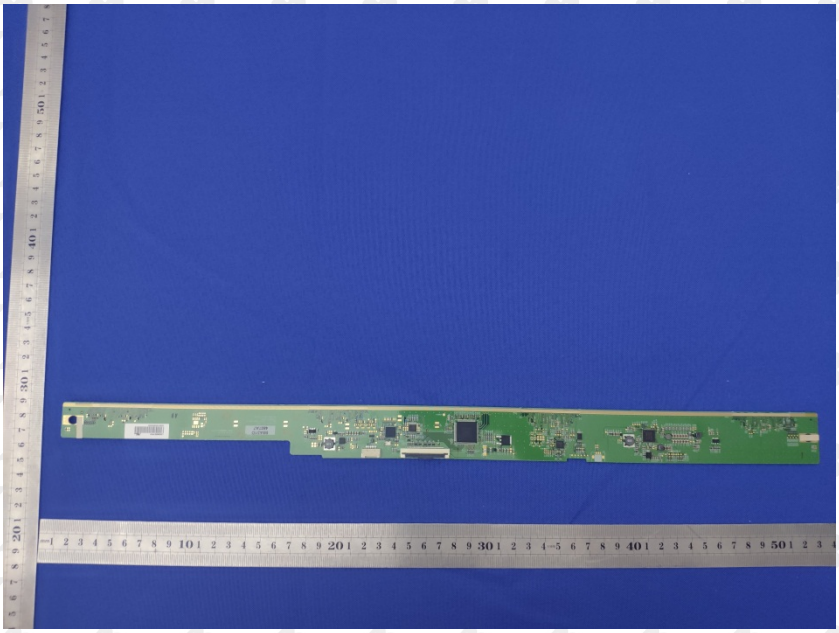
Photographs of EUT





Photographs of EUT





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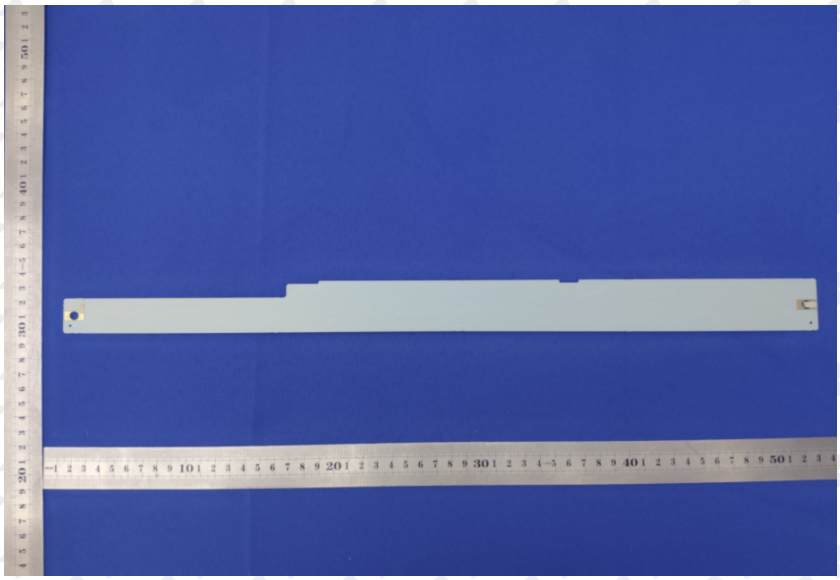

End of report